The Generation Effect and Word Learning: A Test of the Effect of the Language Experience Approach Versus the Text Approach in the Acquisition of New Reading Vocabulary

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(Submitted in partial fulfillment of
the requirements for the degree of
Master of Education)

COLLEGE OF EDUCATION
B R O C K   U N I V E R S I T Y
St. Catharines, Ontario

February, 1990

Acknowledgements

Sincerest thanks to Dr. J. Wagner, my thesis advisor, for his guidance and encouragement throughout the process of completing this thesis. He was an ongoing source of motivation.

Special thanks to Brian Brandon for sharing his computer expertise which was critical to the success of this study and to Marguerite Brandon for her invaluable patience and assistance in the compilation and organization of the data.

Finally, I would like to thank my family - my husband for his understanding and for his ensuring this thesis become a reality, and my sons who are a constant source of inspiration.

Abstract

A class of twenty-two grade one children was tested to determine their reading levels using the Stanford Diagnostic Reading Achievement Test. Based on these results and teacher input the students were paired according to reading ability. The students ages ranged from six years four months to seven years four months at the commencement of the study. Eleven children were assigned to the language experience group and their partners became the text group. Each member of the language experience group generated a list of eight to be learned words. The treatment consisted of exposing the student to a given word three times per session for ten sessions, over a period of five days. The dependent variables consisted of word identification speed, word identification accuracy, and word recognition accuracy. Each member of the text group followed the same procedure using his/her partner's list of words. Upon completion of this training, the entire process was repeated with members of the text group from the first part becoming members of the language experience group and vice versa.

The results suggest that generally speaking language experience words are identified faster than text words but that there is no difference in the rate at which these words are learned. Language experience words may be identified faster because the auditory-semantic information is more readily available in them than in text words. The rate of

learning in both types of words, however, may be dictated by the orthography of the to be learned word.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

The two major approaches to the teaching of beginning reading involve the use of the child's own language (language experience) or the language of others (readers, texts, etc.) Advocates of the language experience approach argue that a child learns to read best using his /her own language:

> What I can think about, I can say.
> What I can say, I can write.
> I can read what I have written. (1)

Language experience teachers capitalize on the existing knowledge of oral language that the child has to assist him/her in mastering the code of written language.

Teachers who employ the use of texts or basal readers in their beginning reading programs are adhering to a systematic, usually phonics-based, introduction to written language. Using this approach, a child is taught a set of rules that assist them in "breaking" the code (decoding) of written language.

In essence, the two approaches differ in their perception of how a child learns. One approach begins with meaningful "whole language" and is known as "top-down" in its method; the other begins with the word fragments and builds to create meaningful language. It is known as being "bottom-up" in its method.

For one method to be judged "better" than the other, it is implied that a child will have fewer difficulties in his/her initial reading, will learn faster, and may enjoy reading more using one approach over the other. Primary educators currently hold the strong belief that beginning readers do learn better using the language experience approach. Few controlled studies exist, however, in which the term "better" is defined.

This strong belief in language experience may be attributed the the "generation effect" which was first delineated by Slamecka and Graf in 1974. Slamecka and Graf tested memory for subject-generated words versus memory for the same words when presented to be read. Performance in the generate condition was superior to that in the read condition in all of their experiments.

Subsequent researchers (Frey and Rhodes, 1980; Gardiner and Arthurs, 1982; McElroy and Slamecka, 1982; Slamecka and Fevreiski, 1983; Glisky and Rabinowitz, 1985; Gardiner and Hampton, 1985; Nairne, Pusen and Widner, 1985; Rabinowitz and Craik, 1986; Payne, Neely and Burns, 1986; Nairne and Widner, 1987; McElroy, 1987;) used various rules - phonetic, orthographic and semantic - and various stimuli - words, non-words and word fragments to test Slamecka and Graf's findings and to gain a better understanding of the generation phenomemon. Explanations as to why the generation effect occurs are numerous. Some researchers feel that generation requires greater cognitive effort than reading which results in greater memorability (McFarland, Frey and Rhodes, 1980). Others view generation as consisting of deeper processing than reading (Gardiner and Arthurs, 1982) while still others perceive generation as recalling an instance from semantic memory (McElroy and Slamecka, 1982). There even exists a school of thought which argues that personal reference plays a major role in the superior memorability of generated over read items.

The most recent research in the area of the generation effect was conducted by Johns and Swanson (1988). They concluded that previous research underestimated the generation advantage due to an inadequacy of visual exposure during the various trials. Johns and Swanson maintain that for accurate assessment to occur study and test formats must be consistent, otherwise an advantage (albeit unintended) is created.

Acquiring new vocabulary or "word learning" involves learning on three levels: semantic (what the word means), phonetic (what the word sounds like), and visual (what the word looks like). Semantic and phonetic learning is facilitated by context and by the reader's pre-experimental experience with language. (Stanovich, 1980; White, 1982; Baltensperger, 1983; Bitondi, Putzman, and Wagner, 1985) Visual word learning involves two components: (1) lexical visual association learning (which could be auditory-visual or semantic-visual); and (2) visual feature (discrimination) learning (Wagner, 1985). Visual feature analysis is critical to learning what the word looks like, in order to recognize it again, and may be better accomplished by isolating the to-be-learned word (Ehri and Wilce, 1983).

Wagner, (1985) argues that there are three initial stages of visual word learning ranging from being able to visually recognize a word but not being able to read it (Stage 1), through "reading" a word on the basis of one or two letters in the given word (Stage 2), to reading a word based on all the letters comprising it (Stage 3).

Stages one and two are often measured in classrooms based on the following criteria:

Stage 1: whether the child can retrieve the name of a to be read word

Stage 2: the ability of the child to read a word in a supportive context.

Stage three, however, is usually not assessed in reading classes. Any attempt to measure stage three would require the systematic use of distractors or foils to measure the amount of visual learning in a word. Although this is sometimes done in reading tests, very few if any current reading programs recommend the continuous assessment of visual discrimination learning in reading words.

The purpose of this study was to assess which approach - language experience or text - is "better" in teaching new words to beginning readers. "Better" was defined in terms of (a) fewer errors in initial reading and (b) faster learning. Specifically, the study entailed measuring voice latency (word identification speed), word identification accuracy and word recognition memory for all three of Wagner's (1985) stages of visual word learning in both the language experience and text conditions.

A microcomputer with a voice activation relay was used to obtain an index of word identification speed in stages 2 and 3 of visual word learning. Although word identification response times (RT's) generally decrease with practice, it was conceivable that language experience words in stage 2 of learning might be read faster than text words in the same stage (as opposed to stage 3 words). This possibility is suggested in activation models of word identification (Anderson, 1983; McClelland and Rumelhart, 198) which allow for facilitation in reaction time from domains other than the domain in which learning takes place.

The general hypothesis of this study was that acquiring words in a language experience condition would result in faster learning for all three stages of visual word learning than acquiring them in text. More specifically:

(1) language experience reaction times may be faster than text reaction times;

(2) language experience accuracy scores may be higher than text accuracy scores; and

(3) language experience recognition scores may be higher than text recognition scores.

It was assumed that the personal relevance of a child's own experiences (semantic information) and the fact that the words' names (phonetic information) are already known in the language experience condition would enable the child to focus on the words' visual features. A limited capacity model of learning (Baddeley, 1986) suggested that this would have the effect of freeing up working memory space so that the child could focus or concentrate on learning the orthography of the new word. On the other hand, the same model indicated that working memory capacity would have to be reallocated to the less familiar semantic and auditory features of the words in the text condition, thus leaving less capacity for visual learning.

CHAPTER TWO

A REVIEW OF THE LITERATURE

What is the Role of Word Recognition in Reading?

During this century, much time and attention has been devoted to better understanding the process of reading. Currently reading is defined as the comprehension of language (Just and Carpenter, 1987), similar to listening in its receptive nature, yet involving an extremely complex perceptual component, the most notable of which is word identification. Parallels between oral and written language, such as the semantic, syntactic and phonological identities of a word, are obvious and generally agreed upon (Ehri and Roberts, 1979; Smith, 1982). The additional component, a word's orthography, and the process through which an individual perceives that orthography and accesses the other identities of the word are major sources of interest and debate.

Just and Carpenter (1986) identify two components of word recognition: (1) encoding the visual pattern of a printed word, and (2) accessing its meaning in the internal dictionary (lexical access). They maintain that to learn to recognize a word, an individual must analyze the graphic information in the printed word and build up an internal representation of it. This entails learning the features, letters, and letter clusters that characterize a particular word and discriminate it from other words. The internal representation must be linked to the meaning of the word so that eventually the encoded visual representation initiates lexical access.

Current reading models concur that for fluent reading to occur, words must be recognized rapidly to the point of automaticity (LaBerge and Samuels, 1974; Stanovich, 1980; Smith, 1982; Spring, 1978; Manis, 1985). LaBerge and Samuels (1974) argue that reading is a series of processing stages involving visual, phonological and episodic memory systems through which information is transformed until it is finally comprehended in the semantic system. The degree to which the to-be-learned information is mastered is evaluated according to accuracy and automaticity. Acquiring automaticity is a slow process compared to the relatively quick rate of acquiring accuracy. Moreover accuracy may have to be established for full automaticity to occur. To achieve accuracy in visual processing the learner must engage in visual feature or discrimination learning. Once accuracy is achieved, many more exposures to the visual features of the stimulus are necessary to achieve automaticity (Laberge and Samuels, 1974).

Laberge and Samuels reason that the achievement of rapid, automatic word identification frees space in working memory for the higher order processes involved in comprehension. Automatic word recognition, then, permits the reader to devote full attention to the syntactic and semantic processes necessary for comprehension. A result of this automaticity, according to Laberge and Samuels (1974), is that the reader no longer needs to focus attention on the processing of visual features.

Morton's logogen model (1969, 1979) proposes an explanation of the cognitive processes that occur during word identification. He defines the logogen as the unit which makes a particular verbal response available from whatever source. Basically each logogen is a unit of information about a word stored in permanent memory which may be activated by visual, auditory or semantic (contextual) stimuli. During word identification, a visual stimulus is presented. When this occurs, analyzed information passes into the visual input system and the appropriate logogen is activated. The word is then produced as a response either through a direct connection to the output system (if such a connection exists) or through the "Cognitive System". In the Cognitive System, a semantic code is accessed which is translated into a phonological code in the output system. Thus, if the word "HOUSE" is presented visually, the logogen for "house" is activated which provides the reader with the semantic background stored in his/her "house" logogen (i.e. what a house looks like, that people live in them, etc.). As this semantic code is accessed, the associated phonological code (the name of the word) is activated and becomes available for output.

The activation level of the visual logogen for a word is a result of its orthographic familiarity or the frequency of exposure to it. High-frequency reading vocabulary will have a lower threshold for visual logogen activation than low-frequency words. When low-frequency words share common visual or orthographic features with high frequency words, their visual logogens may be erroneously activated and correct recognition is slowed down. When a new word is presented for which no visual logogen exists, activation does not occur.

This effect of frequency is consistent with the theory of Just and Carpenter (1986) who believe that how quickly a reader can access a word's meaning depends on how frequently he has encountered the word previously. Words that are used more frequently are processed faster and more accurately than words that occur less frequently, an effect that is referred to as the word-frequency effect.

Anderson (1981, 1983) has investigated the role of response accuracy and response latency in word recognition. He suggests that when a response is given to a stimulus, a memory trace is formed. Over the course of many exposures to a word, the memory trace is strengthened. The trace consists of nodes which are connected to various other nodes. When a stimulus is presented, activation begins with the source nodes and spreads to all traces associated with the stimulus. The amount of activation across a trace is dependent upon the strength of its memory nodes. Higher degrees of trace strength result in greater degrees of success in recognition (accuracy) and retrieval (latency) yet accuracy and latency do not reflect the same properties of a memory trace. Retrieval time or latency is dependent upon the level of activation. Anderson found that latency was a more sensitive indicator of interference (lack of accessibility) than accuracy.

Bitondo, Putzman and Wagner (1985) propose that the visual word learning process involves visual feature learning, and the formation of a lexical association (which can be semantic and/or auditory) with those visual features. They studied the effect of semantic, phonetic and visual orienting tasks on the acquisition of reading vocabulary in isolation and in context. Their data suggested that learning words in context facilitates lexical association learning more than learning words in isolation. They also found that learning words in isolation may facilitate visual feature learning more than learning them in context. Bitondo, Putzman and Wagner (1985) argued that visual feature learning may occur better under conditions where the reader cannot use context to compensate for missing orthographic information.

Wagner (1985) argued that word identification performance depends on how attention is distributed during word learning. Wagner's theory of visual word learning consists of two processes: a) lexical visual associative learning (which includes auditory-visual and semantic-visual associations) and which is indexed by the speed and accuracy of word identification; and b) visual feature (discrimination) learning which is indexed by the accuracy of word identification or by visual recognition accuracy. Within this framework the learner may give his/her attention to visual discrimination learning, lexical associative learning or both. Although each of these types of learning is assumed to require attention, Wagner (1985) has hypothesized that visual discrimination learning requires the least amount of attentional capacity, followed by lexical associative learning and sustained lexical associative learning combined with visual discrimination learning. Wagner (1985) has further argued that the high attentional demands associated with sustained lexical associative and visual discrimination learning may underlie the poor reader's slow learning. One way of reducing these demands is to increase the familiarity of the lexical entry which must be maintained in working memory during such learning. This in turn leads to the possibility that self-generated words may consist of more familiar semantic and auditory features than text words (words not generated by the reader).

Within this model there are three stages of visual word learning. Stage one is characterized by the transition from an individual not being able to read to reading only a minimum amount of cues and involves making an initial association between the lexical entry (name of the word) in long term memory and the stimulus (visual representation of the word). Stage two is characterized by the transition of an individual "reading" a word on the basis of one or two letters in the given word to reading a word based on all the letters comprising it. Stage two involves elaborating the association initiated in stage one by increasing the number of hook ups between letters in the given word. In this stage, reading accuracy improves. Furthermore, this stage may benefit the most from a reduced working memory load resulting from more familiar (generated) lexical information. Stage three involves strengthening lexical-visual associations and speeding up the word identification process through practise in reading the word. In stage three, word identification time speeds up.

The Generation Effect

Perhaps the most widely acclaimed strategy for teaching reading is the language-experience approach. Educators, in using this approach, are capitalizing on the wealth of oral language accrued by children of average intelligence by the time they are six years old. By school age, most children have had enough "experience" to provide the meaning, or concept, base for reading instruction purposes (Stauffer, 1969). One study estimates the number of words known by six-year-olds at about 7,500 (Carroll, 1964). Such rich vocabularies are argued to be superior, as sources for reading vocabulary, to the approximate 400 words of a basic reader or text program (Stauffer, 1969).

In a language-experience reading lesson, the child dictates his/her "story" to the teacher who, in turn, records what the child has said. The teacher, then reads the child's story with him/her so that the child can see the relationship between what s/he has said and the teacher's printed words. Stauffer (1969) argues that what children need, in order to be able to read, is an opportunity to use the vast "sound" knowledge they already possess as they learn that print is no more than speech written down. Language-experience provides such an opportunity.

Related literature documents a phenomenon referred to as the "generation effect" (Slamecka and Graf, 1974). The "generation effect" refers to the superior memory performance for subject-generated words over words, selected by the experimenter, which were presented to be read. Using a "language-experience" type method, Slamecka and Graf found that, in all cases, performance in the generate condition was superior to that in the read condition. Slamecka and Graf concluded that generation requires greater cognitive effort than does reading, which, in turn, increases memorability. They explained that generating involved a deeper processing (which is semantic) than reading (which is an automatic act). Generation is, in effect, recalling an instance from semantic memory. It is for this reason that Slamecka and Graf caution that experimenters must control for the unfair advantage that exists in the generate condition. They argue that the subject should not have free rein in generating but should be constrained in such a way that his/her responses are predictable and are the same as the comparison 'read' condition.

Subsequent to Slamecka and Graf's delineation of the "generation effect", many researchers tested various aspects of this phenomenon in an effort to explain it. McFarland, Frey and Rhodes (1980) reported that internal generation of stimulus words consistently induced higher levels of memory performance than did the encoding of experimenter-generated words. They attributed this greater memorability for subject- over experimenter-generated words to personal reference used in the act of generating and to the "considerable effort" required to produce an item from semantic memory.

Gardiner and Arthurs (1982) added support to the generation effect with their results which showed that a word is more likely to be recalled if it is generated rather than read by a subject. However, they questioned the possibility that generating a word might require greater depth of processing than reading.

When they studied the generation effect using non-words, McElroy and Slamecka (1982) refuted the notion that the generation effect was due to inherent differences in the generate and read processes. They argued that the generation effect depends on using cues in semantic memory and their results suggested that the superior retention associated with generation occurs only when semantic memory is engaged at the time of study. McElroy and Slamecka maintained that semantic memory is necessary but not sufficient to create the generation effect.

Slamecka and Fevreiski (1983) explored the memorial properties of "generation failure". Subjects were asked to generate opposites to stimulus words. Recall of responses at test was found to be independent of subjects' prior success or failure in generating them and higher than the read condition. Slamecka and Fevreiski also found response recognition to be poorer for failures than successes. In addition, they reported significant recognition of failed items even when they were not displayed at input. From this data, Slamecka and Fevreiski theorized that generation failures were actually incomplete generations where semantic, but not surface, features were processed.

Glisky and Rabinowitz (1985) added support to Slamecka and Graf's (1982) premise that semantic memory must be involved in the generation effect. They felt that the act of generating cannot in itself be responsible for producing the effect. Their study involved subjects generating single words from word fragments and then attempting to recognize them in a subsequent test. Subjects either read or generated at both encoding and retrieval. Generating at encoding produced a recognition advantage. Generating at test, however, produced an advantage only if the items were also generated at encoding. Glisky and Rabinowitz argued that theories on the generation effect were incomplete and needed to allow for the role of the repetition of the generation operations at test in producing a memorial advantage.

Gardiner and Hampton (1985) demonstrated a generation effect for various stimuli: meaningful but not meaningless letter bigrams (E T vs. E C); unitized but not nonunitized 2-digit numbers (28 vs. 2, 8); and familiar but not unfamiliar noun compounds (cheesecake vs. cheese ketchup). They felt that generate tasks, when surface features are present, may lead to stronger encoding of those features which benefits recognition memory. Gardiner and Hampton concluded that a generation effect occurs when the to-be-remembered item is: (1) represented in semantic memory as an integrated functional unit and, therefore, (2) perceived and encoded as a familiar concept.

Nairne, Pusen and Widner (1985) investigated McElroy and Slamecka's (1982) findings that semantic memory is necessary but not sufficient to create the generation effect. Nairne et al. argued that generating activates more associations that exist in semantic memory than does reading and that the activated associations can be used as retrieval routes. The difference in levels of activation between generating and reading is believed to be maintained across a multiplicity of generation rules (phonetic, orthographic and semantic) and stimuli (words, nonwords and word fragments).

Regardless of production rule, greater activation is a by-product of generation. Therefore, for a generation effect to occur, an item must be represented in the subject's mental lexicon. The degree to which the generation effect occurs is dependent upon the frequency of use of the item being retrieved from semantic memory.

Rabinowitz and Craik (1986) examined the influence of cues on the generation effect and found evidence to suggest that generation can be guided by different types of information. In one experiment, Rabinowitz and Craik had subjects read or generate target words in the presence of associatively related stimuli. At test, recall of target words was cued with the same stimuli as at encoding or with a rhyme cue. A generation effect was observed when recall was cued with the same associative cues that were present at encoding but not when a rhyme cue was used. In another experiment, rhyme information, rather than semantic information, was used to guide generation and was, therefore, enhanced. Rabinowitz and Craik argued that it is the information used to guide the generation process that is enhanced by generation and that a generation effect occurs only when this information is utilized again at the time of retrieval (test).

Payne, Neely and Burns (1986) replicated McElroy and Slamecka's (1982) work and found a generation effect for words but not for nonwords regardless of whether the stimulus was a word or nonword. Their results support the premise that representation in semantic memory is a necessary but not sufficient precondition for the generation effect. Their results are also consistent with Nairne et al.'s who found no generation effect with nonwords.

Nairne and Widner (1987) produced a generation effect with nonwords by assessing memory for what was specifically generated. They pointed to weaknesses in current research in terms of testing procedures. Generally speaking, generation involves applying a production rule to a word fragment (i.e. produce a rhyme to tray: cl__). Nairne and Widner argued that the to-be-remembered response (clay) is a meaningful "gestalt" comprised of a given fragment (cl) and a generated fragment (ay). When tested, a subject is asked for the gestalt rather than for only what is generated. Therein lay the inadequecy of memory assessment, according to Nairne and Widner. They argued that in generating nonwords, if a subject is tested for the generated fragment rather than the gestalt (which in this case would be meaningless) a generation effect would occur. Nairne and Widner's results replicated Glisky and Rabinowitz's (1985) findings that generation again at test enhances the size of the generation effect.

An analysis of semantic encoding, using homographs as targets, was conducted by McElroy (1987) who found that the generation effect is dependent upon the compatability of semantic processing at study and test. She also found that when meaning is not biased by the encoding context, the subject's preexperimental experience with language determines the meaning that is enhanced by generating. McElroy maintained that the process used to generate (rhyme, synonym, word fragment, etc.) is not important as long as the product of the generation can be processed semantically. She suggested that generating involves more extensive processing of an item's semantic memory attributes, including meaning, because generating is less automatic than reading. In addition, semantic processing may result in a more distinct memory trace. Her findings indicate that one locus of the generation effect is in the processing that occurs after the word has been generated.

Slamecka and Katsaiti (1987) conducted four experiments on the generation effect of free recall. Experiment 1 showed a generation effect with unilingual but not bilingual word pairs using a within-lists design. Experiment 2 found no generation effect with either bilingual or unilingual pairs using a between-lists design. Experiment 3 involved unilingual word pairs in a between-subjects design. A comparison was made of pure and mixed-list presentations of generate and read items. Slamecka and Katsaiti found an "impressive generation superiority" whenever generate and read items were mixed into the same study list. The effect disappeared, however, when the two types of items were segregated into separate lists. Experiment 4 involved unilingual word pairs in a mixed-list, within-subjects design. Displaced rehearsal was prevented and no generation effects were found. Slamecka and Katsaiti concluded that the generation effect is "an artifact of selective displaced rehearsal that strengthens generated items at the expense of read items."

Gardiner, Gregg and Hampton (1988) tested Nairne, Pusen and Widner's (1985) findings that low-frequency words were no more likely to be recognized if they had been self-generated than if they had been read. Gardiner et al. found not only that generation effects occurred for low-frequency words but also that those effects were on the whole indistinguishable from effects obtained with high-frequency words. Their conclusion was that word frequency does not lend support to an associative hypothesis over a lexical one.

Nairne and Widner (1988) conducted two experiments to address the question of whether representation in the mental lexicon is a sufficient condition for obtaining the generation effect. They found that low-frequency words did produce significant retention advantages when generated but only when the words were highly familiar to the subjects. Generally speaking, their results support the argument that lexical representation is neither a necessary nor a sufficient condition to produce the generation advantage. Rather, what appears to be important is whether or not the lexical representation is elaborated in semantic or auditory memory.

The most recent insight into the cause of the generation effect has been provided by Johns and Swanson (1988) in their experiments with nonwords. Johns and Swanson challenged previous methods in studying the generation effect by pointing out that generated items are never given the same amount of visual exposure as read items. In their test of the generation effect using nonwords they displayed the target at the end of each generate trial to provide the same visual exposure to generated nonwords as was provided to read nonwords. This feedback, they maintained, balanced any advantage of greater visual exposure held by the "read" condition. Johns and Swanson argued that all reported generation effects underestimated the generation advantage because of this defficiency in visual exposure in the generate condition. Johns and Swanson's study also analyzed the effect of varying study and test formats. Their conclusions support Nairne and Widner's (1987) argument that study and test formats must be consistent to accurately assess any generation effect.

In summary, there seems to be three differing areas of thought about the generation effect. One argues that for a generation effect to occur, the word being generated must already exist in the subject's semantic memory. The act of generating, therefore, becomes a retrieval from semantic memory. As such, knowledge for the word exists on at least two levels, semantic (what the word means) and phonetic (what the word sounds like).

A second school of thought about the generation effect maintains that for the effect to occur, a word must be represented in the generator's mental lexicon. The frequency with which the word is retrieved from semantic memory determines the extent of the generation effect. Again, there is supposition that knowledge of the word already exists on at least two levels (semantic and phonetic) which, in turn, is enhanced by the frequency of lexical retrieval.

The third position argues that words consist of (at least) three representational domains - semantic, auditory and visual and that the generation effect may, in fact, be confined to whether or not the generation task requires processing in a given domain. For example, if semantic information was used to generate a word, a generation effect would occur if the semantic information was used again at retrieval. This third position maintains that what is generated is best remembered.

All attempts to account for the generation effect make common assumptions: the subject generating the word knows the meaning of the word and the name of the word. In terms of word learning in reading, what is lacking is the visual information or surface features. By having a subject generate his/her own to-be-learned words, s/he is bringing semantic and phonetic information to the word learning situation. S/he then may be free to focus on the visual features of the to-be-learned word. In the "read" condition, the reverse process occurs. The visual features of the word have to be learned and/or decoded first before the other levels (semantic and phonetic) can be accessed.

Literature on the "generation effect" would suggest, then, that a generation situation may be preferable to a text or read situation in learning new reading vocabulary. Thus, the implications for children learning to read are that children would be more successful at reading if they were involved in producing their own reading materials. Children using semantic and auditory information gathered through their prior experiences to generate "stories" to be read, would only have to learn the visual information associated with the words of their stories in order to read them. The process of learning to read would be made easier for students who generate their own words to be read, a process known as language-experience.

Teaching Beginning Readers

Most of the research cited thus far has involved experienced readers, some elementary school children but mainly university undergraduates. Very little empirical data is available about beginning readers. Ehri and Roberts (1979) addressed the word learning process using Ehri's theory that the capability to read emerges when the reader becomes able to store printed words in lexical memory. Ehri defines the lexicon as a repository for the words a child has acquired by learning to speak. In that lexicon, a child stores: the pronunciation or phonological identity of a word; a characteristic form class or syntactic identity; and a meaning or semantic identity. When the child practices reading a word, its orthographic form (a visual image) is retained in memory and amalgamated with the other identities of the word so that one unit is formed. Once this process is completed, the reader no longer needs to use general decoding skills to identify words in his lexicon. He accesses memory by matching the print to his stored visual image.

Ehri and Roberts used first graders to study the difference between learning printed words in context vs. isolation. Half of the subjects studied words in printed sentence contexts and the other half studied words printed singly on flash cards and listened to sentences containing the words. Ehri and Roberts concluded that context readers learn more about word meanings yet they appear to learn less about its orthography than subjects who studied the words on flash cards. Isolated word training was advocated in that it allows readers more time to study words as separate units, noting letter details and corresponding sounds, creating a more complete image a given word in the reader's lexicon.

Isolated word training was studied by Reifman, Pascarella and Larson (1981) in their test of the effects of word-bank instruction on sight word acquisition. Reifman et al. worked with first grade children using the language-experience approach. They described the language-experience approach to teaching beginning reading as a method of teaching that involves the use of the child's own language which is dictated to someone who records it. Once recorded, the child's dictation becomes the main source of instructional material. Reifman et al. discussed the advantages of the language-experience approach in terms of how it utilizes the child's existing knowledge of and skills in phonology, syntax and lexicon by integrating oral and written communication. In the word-bank experiment, both conditions used language-experience but the experimental condition was augmented by a total of six hours of individualized word-bank activities designed to reinforce phonics, spelling, etc. Reifman et al. reported significantly higher levels of posttreatment sight word vocabulary achievement in the experimental condition and concluded that the word-bank procedure may be an effective strategy for increasing the positive influence of language-experience instruction with beginning readers.

Noble (1981) tested a variation of the vocabulary self-selection stategy using students who were reading two years or more below expectancy. Each student was provided with a tutor who recorded all miscalled words during the oral reading of a passage. From his own list, each student was asked to select a few words he would like to learn. For each word the student selected, a word was chosen by the instructor. The words were then taught in a mixed sequence using sight word procedures and reinforced through short practice exercises. Instruction and follow-up took approximately 10 to 20 minutes. During the next session, without reviewing the previously selected words, the student read the original passage. Errors on the words selected by the student and instructor were recorded. Eleven out of sixteen students learned more self-selected words than tutor-selected words. The other five students learned an equal amount of both. Noble concluded that self-selection may facilitate motivation which in turn improves the learning of reading vocabulary.

Harker (1981), in his article entitled, The Language Experience Approach - A Rationale, identified five assumptions which he felt underlie the language experience approach and examined them in order to establish their validity. His assumptions were that (1) reading is a communication process closely related to the learning and development of the other language processes - writing, speaking and listening; (2) there is a close relationship between a child's language development and his concept development; (3) learning to read is directly influenced by a child's attitudes, interests, and experiences; (4) the difficulty experienced by many children in learning to read results from their confusion about the nature of the reading task; and (5) the purpose of teaching reading is to provide the child with a means for increasingly independent exploration in an expanding realm of experience; it provides them with tools to further investigate their ever-increasing world. Harker argued that language-experience develops in children an expectation that reading is a meaning-getting activity. Using the language-experience approach, beginning readers read their own messages which are interesting and have purpose. This expectation, Harker argued, then carries over to reading material written by others.

Nolan (1982) tested the language-experience approach to learning new words against the text approach and found a highly significant difference between student performance in the two conditions on a recognition test of pseudo-words. Nolan concluded that inexperienced readers appear to learn more about the visual features of words when they are self-generated as opposed to teacher-supplied. She explained that this result may occur because, in the language-experience condition, the student does not have to switch his attention between decoding and comprehension to complete the reading task. Meaning already exists so the reader is free to devote his full attention to decoding which, Nolan argued, results in faster word acquisition.

White (1982) replicated Nolan's study and confirmed her results. On a recognition test of pseudo-words, White found that the success rate was significantly higher in the language-experience condition over the text condition. White, like Nolan, concluded that the language-experience method should prove to be the most effective method to teach beginning reading since it eliminates the need for the reader to switch his attention from decoding to comprehension.

The second part of White's study examined the effect of context on the learning of new words. He concluded that when students are presented with new words in context, they concern themselves more with deriving meaning and less on feature analysis. Consequently, language-experience and text based methods may have differential effects.

Language-experience words are unequivocally meaningful to the generator of those words. Nonetheless, a high proportion of words generated will be nouns or content words. Flores d'Arcais (1984) explored the lexical availability of function versus content words in a series of word recognition tests. Function words included connectives and prepositions while content words included nouns and verbs. He found that content words are better named than function words at all ages. He attributed this "availability" for recognition to the meaningfulness of content words over function words. In addition, he found that context can improve word recognition when the words are already somewhat available. This occurs with content words for beginning readers and occurs to an extent with function words for older children.

Yore and Ollila (1985) studied the effect of word abstractness in addition to the effects of global cognitive development and gender on young readers' word recognition. Their results indicate that: noun words were recognized more frequently than non-noun words; children with high cognitive development recognized more words than children with lower cognitive development; and females recognized more words than males.

Yore and Ollila explained that noun words, being more concrete than non-noun words, are learned more easily because the child has formed object concepts before ever seeing the printed words and then simply maps the word concept over the corresponding object concept. Experiencing abstract words (verbs and other predicate words) requires the reader to develop new schema or adapt other schema before the symbolic representation can be "mapped" onto the predicate concept.

The "concreteness" of a word could affect the difference in word recognition scores between students with low cognitive development and those with high cognitive development. Regardless of how concrete a word is, students with low cognitive development will not likely achieve better than students who are more highly developed in this area, however the difference in their scores could be smaller with concrete words than with more abstract words.

Word recognition differences related to sex of the subject favored the female students but was not significant.

Yore and Ollila discussed the idea of limiting early reading material to concrete words in order to give the student freedom to become familiar with the visual form of known words rather than developing concepts for unfamiliar words. They felt that such an approach would likely maximize the time devoted to the development of word recognition skills, increase the likelihood of early success, and reinforce the young readers' confidence.

General Conclusions

It would appear, from available research, that for a child to experience success in learning to read s/he must be involved in visual feature learning and lexical association (Bitondo et al., 1985; Wagner, 1985). Once the child has learned the visual features of the word, s/he will be able to rapidly recognize it (LaBerge and Samuels, 1974). When word recognition becomes rapid enough to be automatic, space in working memory is freed for higher level processes such as those involved in comprehension (LaBerge and Samuels, 1974).

Which method to teach this process is the most effective? The two most common methods are language experience, where the child generates his/her own reading vocabulary from his/her own oral vocabulary, or text, where the child's reading vocabulary is provided. There is strong support from the "generation effect" research in favour of the language experience approach (Slamecka and Graf, 1978;

Gardiner and Hampton, 1985; Nairne et al., 1985). Using the language experience approach, the child brings semantic and phonetic knowledge of the word to the reading situation. The child is then cognitively free to focus on the visual features of the word. As the child masters the visual features of the word, s/he processes the word automatically (LaBerge and Samuels, 1974), leaving his/her working memory available to focus on the larger meaning of the passage.

In the text situation, the child is provided with the visual features of the word which s/he must encode and then access corresponding semantic and phonological codes from permanent memory if, indeed, the child has a representation in memory for that word (Morton, 1969, 1979).

Implications For This Study

Based upon current knowledge, through contemporary literature, about word recognition, the generation effect and methods of teaching children to read (language experience versus a more traditional text approach) it is hypothesized that children who generate their own words to learn will exhibit superior performance compared to students who are given the same to be learned words (Slamecka and Graf, 1978).

Superior achievement will be characterized in several ways. Specifically, children in the language experience condition should read the to-be-learned words faster (their reaction times will be faster) than words learned in a text condition. Subject-generated words should be identified faster for two reasons. First, subject-generated language-experience words should consist of semantic and auditory logogens which have lower activation thresholds than text or experimenter given words. The lower activation thresholds represent greater familiarity in these domains and should result in faster response times independent of the amount of learning in the visual domain (Morton, 1979). Second, if self-generated words free up attentional capacity then more visual discrimination learning may occur as a by-product. This too would result in faster word recognition as a result of lower activation thresholds. However, in this second case one would expect superior performance in both reading accuracy and visual recognition memory accuracy.

These predictions should result in a different pattern of results for three dependent variables used in this study. These can be formalized in the following hypotheses:

(a) The generation effect is a function of the act of activating specific logogens of a to be remembered word. Those logogens which are activated through generation or production will show higher retention compared to logogens which are activated through receptive processing. As language experience instruction procedures normally require the activation for production of the semantic and auditory logogens of a word but not the visual logogen, this leads to the hypothesis that language experience words may be read faster but not necessarily more accurately. Thus response times should be faster for language-experience words when compared to text or given words but there should be no difference for reading accuracy or recognition memory accuracy. (Rabinowitz and Craik, 1986)

(b) Words that are generated by a child tend to be more familiar (semantically and auditorally) than words which are given. This familiarity tends to make it easier for the child to retain lexical information in working memory when learning the word and this should free up attentional capacity for visual discrimination learning. This leads to the hypothesis that generated words should be associated with superior performance in visual discrimination learning as indexed by reading accuracy and visual recognition memory accuracy over repeated trials. In other words, the slope of learning curves for these two dependent variables should be steeper in the case of language experience generated words than for text or given words. At the same time it is important to keep in mind that this hypothesis does not rule out the additional difference of faster reaction times for generated words as a function of the familiarity of their semantic and auditory domains. In this case, however, a steeper learning curve would not be expected. (Wagner, 1985; Nolan, 1982; White, 1982)

(c) It also can be hypothesized that recognition scores will be higher in a language experience condition than in a text condition. According to Gardiner and Hampton (1985), a generation effect occurs when the to-be-remembered item is represented in semantic memory as an integrated functional unit and, therefore, is perceived and encoded as a familiar concept. Language experience words are represented in the generator's semantic memory and as such, are perceived and encoded as familiar concepts. An advantage, therefore, should exist for language experience words over text words in terms of recognition. Whether or not this should effect the slope of the learning curve for generated words is not clear, however.

CHAPTER THREE

METHOD

Subjects:

The subjects in this study were 22 grade one students from a regular classroom. They represented varying abilities from beginning readers to non-readers. Because the pilot study was conducted during the course of the school year permission was obtained from the Superintendent of Student Services to utilize the research methods as part of the language component of the grade one program. As the research continued into the summer months, parental permission was obtained for all subjects and small groups were transported to the researcher's home daily to complete the experiment.

Of the twenty-two subjects, eleven were male and eleven were female. Ages ranged from 6 years 4 months to 7 years 4 months at the outset of the study. All students were native English speakers and came from families of middle to upper-middle class socio-economic status.

Materials:

The basic piece of apparatus used in this research was an Apple IIe microcomputer. Various components were constructed to complement the computer so that the highest degree of accuracy in speed measurement could be achieved.

To collect the data needed for this study, a custom-designed computer program was used which enabled the experimenter to enter and save 8 student-dictated words. The experimenter then made various changes (3 per word) to the 8 words to create distractors. Since the target word was to appear at least once per six trials, a chart was created to plot the order in which the target word and distractors would appear. Then, using a table of random numbers, the experimenter entered the target words and distractors into the program. After each episode, the list of 48 words/distractors was re-entered into the computer using a table of random numbers to avoid any possibility of memorization based on the order in which the words appeared.

Response time was measured by a voice-activator attached to the computer which had been equipped with a clock card. The voice-activator was designed from a microphone and a voice operated relay and, combined with the clock card, allowed reaction times to be measured to the millisecond.

The Stanford Diagnostic Reading Test was administered to the whole class to assess their reading abilities and provide information to support decisions about the pairing of students.

Procedures:

The students were paired according to reading ability. This matching was determined by scores on the Stanford

Diagnostic Reading Achievement Test and by teacher observations. Within each pair, student A was exposed to the language experience condition first, then the text condition. Student B was exposed to the text condition first, then the language experience condition.

Pilot Study

The purpose of the pilot study was to ascertain the practicalities of attempting such research within the course of a regular grade one program. A previous study (Tapson, 1985) had established a working framework for the present study in terms of expected vocalization-latency response times and the number of repeated presentations required to reach assymptote levels of reaction times.

The pilot study involved two sets of partners representing both ends of the developmental continuum. One pair were confident beginning readers while the other pair had some knowledge of sound symbol relationships but relied predominantly on initial consonants in their word recognition.

In the language experience condition, the experimenter dialogued with the subject to develop a list of eight words, each having some particular meaning to the subject. The experimenter recorded the words and then developed a chart of visual distractors by changing the target word (i.e. "team") in the following ways:

1) change the first or last letter ("feam");

2) change a middle letter ("teum"); and

3) change the order of the two middle letters ("taem").

(See Appendix 1)

Upon completion of the chart, the experimenter entered the introduction list (the 8 stimulus words) and the training list (stimuli and distractors - 48 in total) in random order, into the custom-designed "Soundswitch" program. Once this information was entered, it was saved to an individualized file.

The first step in working with a student at the computer was to adjust the voice activator to his/her unique voice level. The activator was an extremely sensitive device and had to be set precisely to obtain an accurate measurement. If the activator was set too low, peripheral noises could accidentally trigger the device and, conversely, if the activator was set too high, no activation would occur or the child would raise his/her voice to trigger the activator and the reaction time was no longer reliable.

The initial session, at the computer, involved a "teaching" component where the 8 stimulus words, which had been dictated by the language experience subject, were presented on the screen in a vertical list. All words were typed in lower case letters and presented in the centre of the screen. (See Appendix 2) The student was asked to look at each word and was told what the name of the word was by the experimenter. The list of words remained on the screen for approximately two minutes while the student practised "reading" them with assistance when needed from the experimenter. A one minute waiting period followed before individual presentations of the word occurred.

During the presentation of the training list, visual distractors appeared randomly in half of the presentations. All of the distractors were pronounceable. The stimulus list of eight words was presented three times (24 presentations) and the three distractors for each word were presented (24 presentations) for a total of 48 presentations in each block. (See Appendix 3)

Prior to each individual presentation, to focus the child's attention, a message ("Get ready for probe word!") appeared on the screen for 5 seconds. Then the probe word appeared (See Appendix 4) and the child "read" the word. The voice-activator, consisting of a microphone connected to a voice-operated relay, was utilized to time the speed with which the given word was read. When the voice activator was triggered, another message ("Voice switch activated") appeared and the reaction time was scored. If the child did not respond, the "Voice switch activated" message appeared and a time of 5 seconds was automatically scored. The experimenter recorded response accuracy and any accidental activations or non-activations. The probe word remained on the screen throughout this procedure.

The experimenter then asked the student if the word on the monitor was the word that s/he had been taught. The subject stated either "yes" or "no" and the experimenter recorded recognition accuracy. (See Appendix 5) Feedback was provided regarding pronunciation and recognition. If a word was pronounced incorrectly, the error was corrected and the subject was asked to repeat the correct pronunciation. If a recognition error occurred, the experimenter simply stated that an error had occurred.

At this point, the experimenter reset the voice activator and, by pressing any key on the computer, was ready to continue. The message, "Get ready for the probe word", appeared again and the process was repeated. After a block of words had been presented, the reaction times for each presentation was printed out. The experimenter applied a chart of random numbers to each print-out, then entered the new order of 48 probe words thereby creating a new file. This process was followed subsequent to each of the first nine sessions. The end result was that each language experience subject had ten files containing his/her probe words in varying random orders.

In the text condition, each subject began with the two minute "teaching" component in which s/he was shown his/her partner's words and the names of the words were provided. Again, a one minute wait occurred during which time the experimenter and subject dialogued to prevent rehearsal of the stimulus words. Then, presentations of individual words began. Since individualized files had been created for each language experience subject, each text subject was exposed to his/her partner's files.

Findings of the Pilot Study

Because of the extremely sensitive nature of the voice-activator and the active nature of a grade one classroom it was apparent from the outset that the apparatus could not be utilized effectively in the classroom proper during a regular lesson. Instead, the computer was set up in a small workroom adjoining the regular classroom. To ensure accuracy of the voice activator, the door to the workroom had to remain closed while the "Soundswitch" program was being utilized.

There were two major problems which quickly surfaced in the pilot study. The first was the frequency of interruptions (i.e. people coming to the door) which inevitable triggered the voice-activator. The second problem centered on supervision. Each session took approximately 15-20 minutes. If the experimenter, a classroom teacher, worked with one child, in the adjoining workroom, with the door closed for 15-20 minutes, the remainder of the class would have to be left unsupervised for that length of time. Fortunately, a teaching assistant who was assigned to this classroom was in fulltime attendance to oversee supervision but the situation was still not acceptable. What followed the first couple of sessions was the active seeking of one-to-one time which did not involve the supervision of other students. Consequently, much of the data collection for the pilot study occurred during recesses, lunch times and planning periods.

The conclusion of the pilot study was that privacy would be critical to the accuracy of the study.

Experiment:

The major alteration to the pilot study involved a change of venue. To ensure greater privacy and therefore increased accuracy of the voice activator, the students were transported, in small groups (4-6), to the experimenter's home for half-day periods. This major block of data collection occurred during the summer. Each subject was involved in two sessions per day for five days. His/her condition was then switched (language experience to text or vice versa) and the process was repeated. Each subject was in attendance for ten half-days.

The procedures for the experiment were identical to the pilot study from the initial dialogue to compile the list of eight stimulus words to the random ordering of the print-out of the 48 probe words in order to create a new file for each session. When each of the language experience subjects and their text partners had completed ten sessions, the entire process was repeated with the text subjects becoming language experience subjects and vice versa.

By the completion of the study, all twenty-two children had been exposed to both the language experience and text conditions. They had been yolked to their closest match in terms of reading level to counterbalance any effect which might have resulted from varying abilities.

Treatment of Data:

When all the data had been collected, to improve manageability and to prepare for analysis, it was organized into individual charts - one per student. These charts reflected the mean reaction times plus mean accuracy and recognition scores for both real words and distractors over the course of ten sessions (which amounted to 30 trials per word) in both the language experience and text conditions for a total of twenty sessions. (See Appendix 7)

At the end of each session, the list of forty-eight probe words was sorted then the average reaction time was calculated for the twenty-four real words and the twenty-four distractors in each list. Accuracy and recognition percentages for both real words and distractors were also calculated at the end of each session and recorded with the average reaction times on the student's individual chart in the respective "language-experience" or "text" condition.

The data from the experiment was collected over the course of 440 sessions (twenty sessions per child X twenty-two children). It was then analyzed using three procedures:

(A) an analysis of the mean scores of each subject for each of the dependent variables comparing language experience to text;

(B) an analysis of all the pre-post (first and last) reaction time scores (within subject) X (between conditions); and

(C) an analysis of the trials to criterion data of the accuracy data on the words and distractors.

Results:

Analysis A showed a significant difference for the reading times between the means of the language experience and text conditions [F(1.21) = 4.802. p .05]. This confirms the hypothesis that (on the average) language experience words are read faster than text words (as indexed by reaction time). See figure 1 (a).

An analysis of the distractor reaction times showed no significant difference [F(1,21) = 2.9274, p 1] although language experience distractors, on the average, were read faster than text distractors. See figure 1 (b).

Accuracy means were compared for both real words [F(1,21) = .15889] and distractors [F(1,21) = 6.9499..E-] with no significant findings between conditions. See figures 2(a) and 2(b).

Figure 1(a)

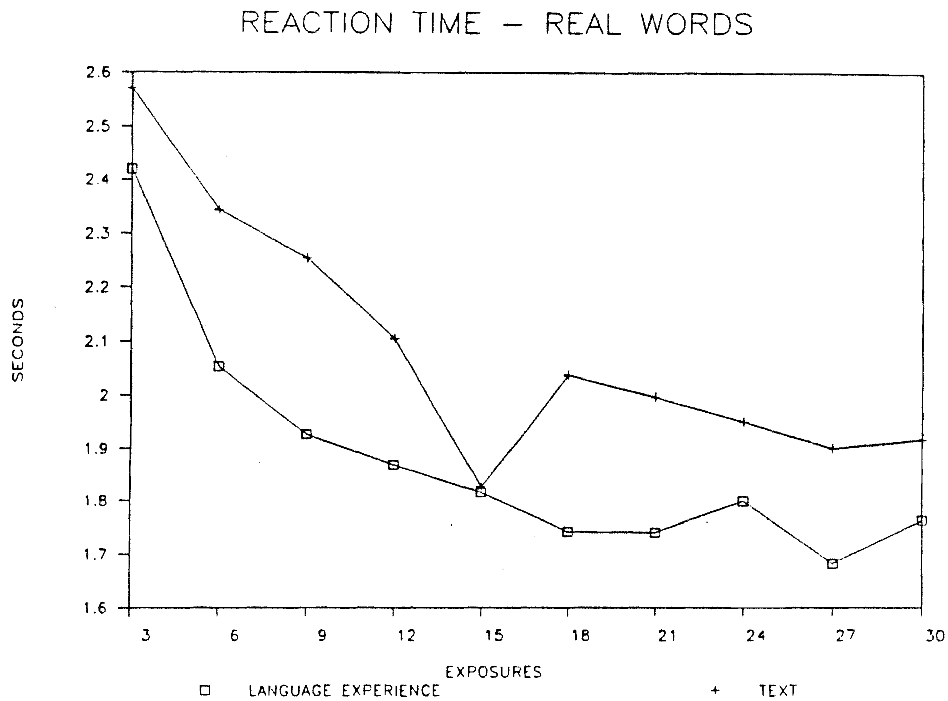


Figure 1(b)

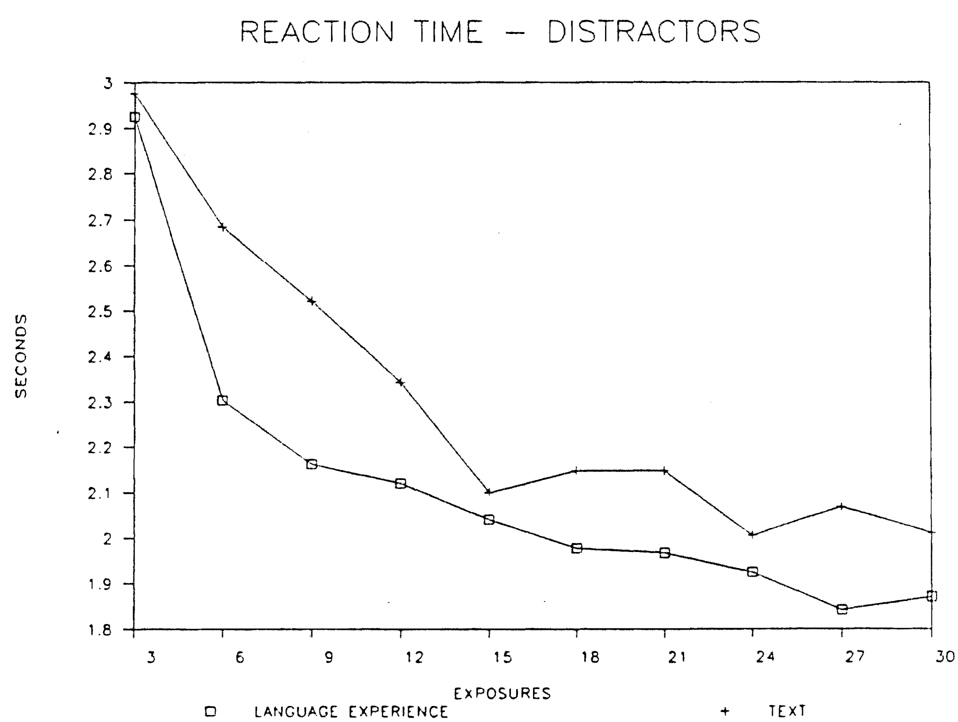


Figure 2(a)

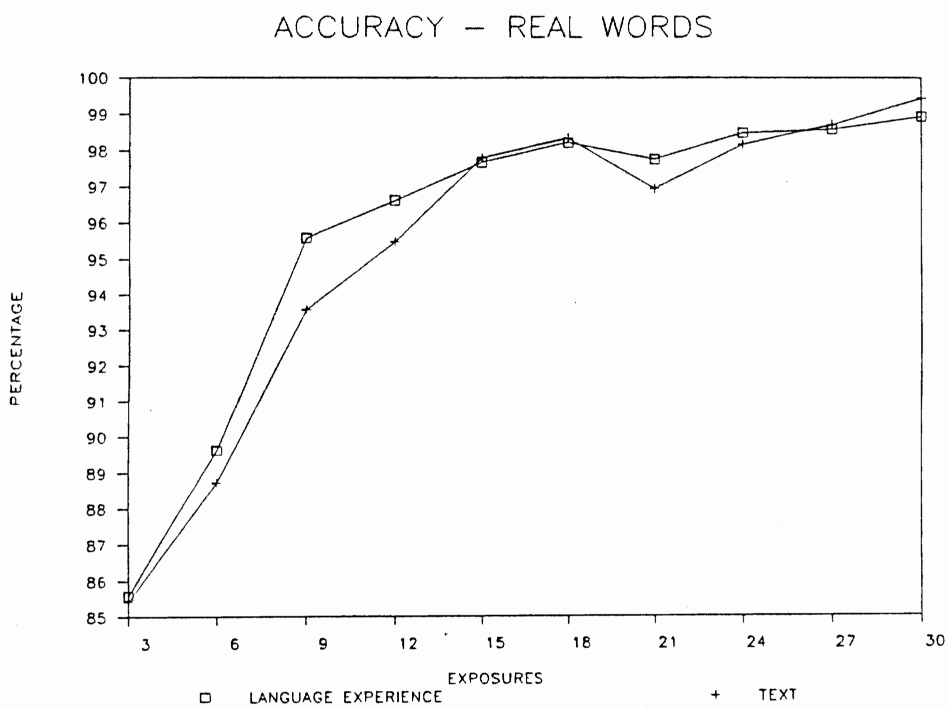
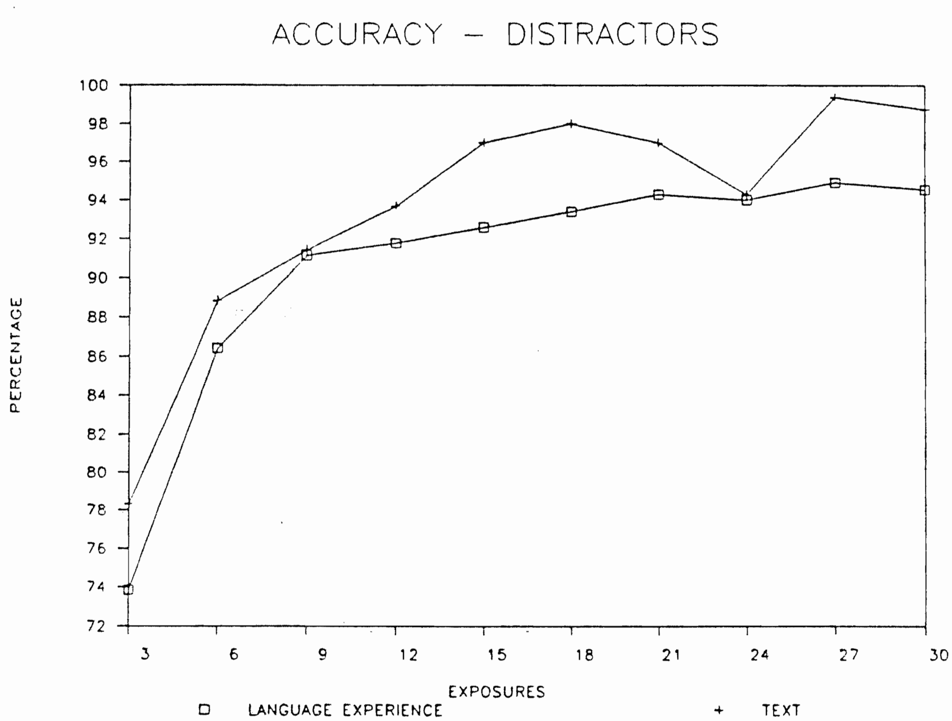


Figure 2(b)



Recognition means were also compared for real words [F(1,21) = .31976] and distractors [F(1,21) = 2.92742]. Again, none of the findings was significant. See figures 3(a) and 3(b).

In analysis B, the hypothesis that children learn words better using a language experience approach was examined. A pre-post test comparison of reaction time data for real words showed that in a 2 way repeated measures ANOVA there was a significant effect for the pre-posttest comparison [F(1.21) = 28.2756, p .01] but not for the language experience vs. text comparison [F(1,21) = 0.8724), p 1] nor the interaction of these two conditions [F(1,21) = 0.0234, p 1]. (See figure 1 (a)).

A repeated measure analysis of variance was also carried out on the distractor reaction time data, the distractor accuracy data and the distractor recognition data with no significant between group findings. All subjects improved in both conditions between pre and post tests but the improvements were not significantly different across conditions. These analyses suggest that children learn words, after repeated exposure to them, in both the language experience and text conditions.

Finally, analyses of the trials to criterion data of the accuracy data on the words and distractors was carried out, however, neither of these analyses was significant.

Of the three specific hypotheses outlined, only the first, that language-experience words should be read faster

Figure 3(a)

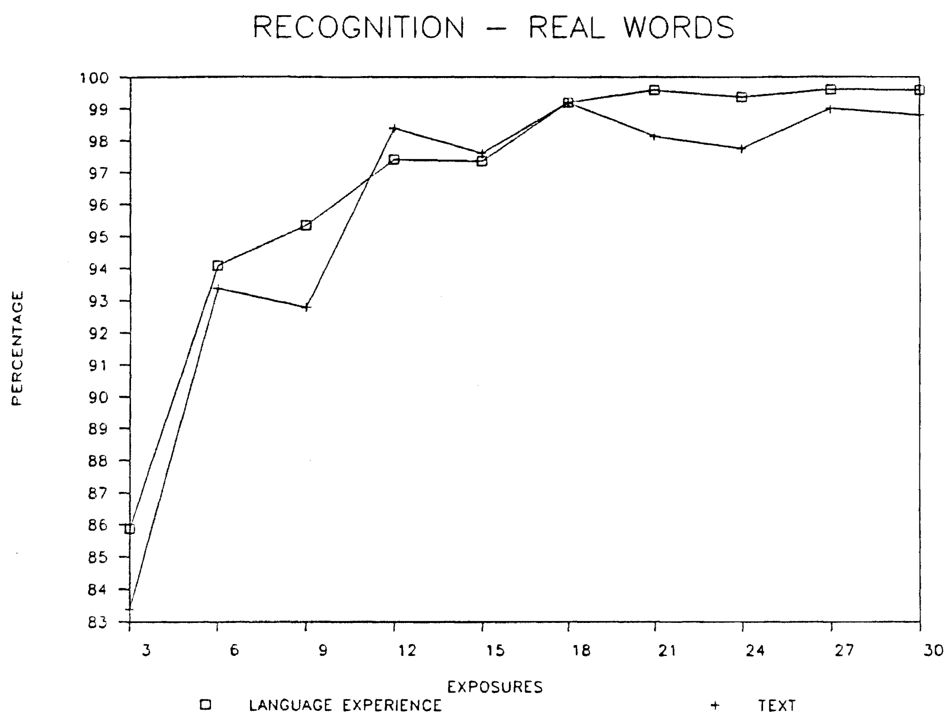
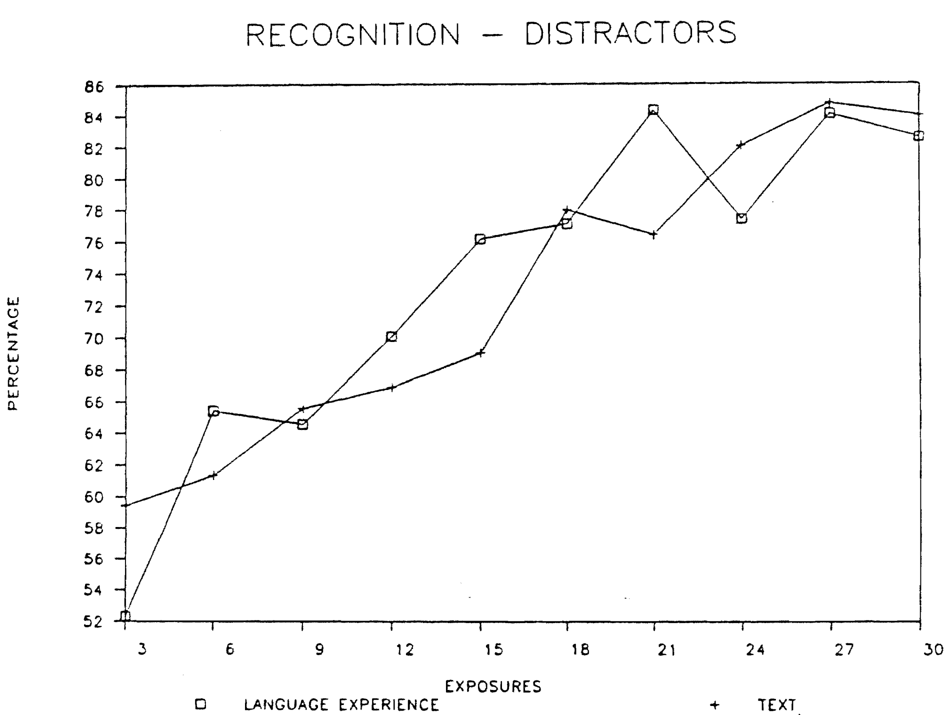


Figure 3(b)



than text words (as indexed by reaction times), was confirmed (analysis A). Analyses B and C addressed the hypothesis that language-experience words should be learned faster (as measured by accuracy data) yet this did not prove to be the case. It also was assumed that in the language-experience condition, existing semantic (the personal relevance of the child's own experiences) and phonetic information (the words' names) would "free" the child to focus on the visual features of his generated words resulting in superior performance. The visual recognition data, however, indicated that there were no significant differences between the language-experience and text conditions.

CHAPTER FOUR

DISCUSSION

In the first analysis, subjects were found to read their language-experience words faster than their text words. This finding is consistent with Slamecka and Graf (1978), who tested memory for subject-generated words against memory for the same words when they were simply presented to be read and found superior performance in the generate condition. Slamecka and Graf cited greater cognitive effort in the act of generating which, in turn, increases memorability as an explanation for their results. They argued that generation is actually retrieving an instance from semantic memory.

Superior performance in the generate (language-experience) condition is also consistent with McFarland, Frey and Rhodes (1980), who found that internal generation of stimulus words consistently induced higher levels of memory performance than did the encoding of experimenter-generated words. McFarland et al. attributed the greater memorability to personal reference used in the act of generating and to the "considerable effort" required to produce an item from semantic memory. Both explanations are viable in accounting for the superior performance of subjects in the language-experience condition in this experiment. Words generated by individual subjects had a high degree of personal reference (i.e. hockey, cottage, bunny) since each was generated from the individual's experiences.

Gardiner and Hampton's (1985) conclusion that a generation effect occurs when the to-be-remembered item is: (1) represented in semantic memory as an integrated functional unit and, therefore, (2) perceived and encoded as a familiar concept can also apply to the results of analysis A. Superior performance in the generate (language-experience) condition over the text condition can be explained thus: for a child to generate a word from his/her experiences, the generated word must exist in semantic memory as an integrated and functional unit.

Another study which lends support to the results of analysis A is that of Nairne, Pusen and Widner (1985). Nairne et al. concluded that greater lexical activation is a by-product of generation, therefore, for a generation effect to occur, an item must be represented in the subject's mental lexicon. The degree to which the generation effect occurs, according to Nairne et al., is dependent upon the frequency of use of the item being retreived from semantic memory. Since the subjects in this study generated words from their own personal experiences, the generated words had a high degree of personal relevance and, as such, were frequently used words.

McElroy (1987), in her study of semantic encoding, found that when meaning is not biased by the encoding context, the subject's pre-experimental experience with language determines the meaning that is enhanced by generating. She suggested that semantic processing may result in a more distinct memory trace. Since all words in this study were presented in isolation, there was no encoding context to create bias. The subject's preexperimental language-experience, then, determined the meaning attributed to the generated word. In the language-experience condition, each subject brought readily accessible meaning with each word generated. The semantic processing which occurred in the act of generating, therefore, may have resulted in a more distinct memory trace than was created in the text condition, thus facilitating faster activation and retrieval of the semantic logogen in the language-experience condition.

Anderson (1981, 1983) explains the role of response latency in word recognition in terms of memory trace formation and strengthening. He believes that when a response is given to a stimulus, a memory trace is formed; then, over the course of many exposures to a word, the memory trace is strengthened. Greater trace strength results in greater degrees of success in recognition (accuracy) and retrieval (latency). Anderson went on to distinguish between accuracy and latency as indicators of independent properties of a memory trace. Latency, according to Anderson, is a more sensitive indicator of interference (lack of accessibility) than accuracy. This, then, would explain why, in this study, subjects could achieve comparable scores in both language-experience and text conditions in terms of accuracy and yet have faster latency scores in the language-experience condition. Although words are learned equally well in both conditions, words in the language-experience condition are read faster because they are accessed faster in the child's mental lexicon.

The significant effect found in the second analysis occurred in the within subject analysis of the pre-post (first and last) reaction time scores. This effect suggests that significant word learning occurred in both conditions after repeated exposure to the words.

Johns and Swanson (1988) maintained that the full impact of the generation effect had, previously, not been accurately measured because generated items, in prior studies, had never been given as much visual exposure as read items. In this study, language-experience or generated words were given the identical visual exposure to the text or read words, to balance all variables in an effort to measure singly the impact of generation on word learning. When identical visual exposure was provided in both conditions, children learned equally well in both conditions, as evidenced by the fact that no interaction was found between the conditions for the accuracy data.

Thus the results of this study suggest that neither approach to teaching new words to beginning readers - language-experience nor text - can be said to be "better" than the other. "Better" for the purposes of this experiment was defined as: children will (a) have fewer difficulties in their initial reading and (b) will learn faster. The results of the pre-post (first-last) reaction time data show that there was no difference in the rate of learning between conditions.

Recognition and accuracy scores also indicate that there were no significant differences between language-experience and text words. Generally speaking, each method resulted in the effective teaching of new words.

The personal relevance brought to bear by the child, through the act of generating the words, however, seems to create a semantic advantage that allows faster lexical access and therefore faster reaction times in the language-experience condition.

A high percentage of words (138 out of 145) generated by the language-experience subjects were nouns or "function words" (Yore and Olilla, 1985; Flores d'Arcais, 1984). This meaningfulness facilitated the "availability" for recognition since semantic and syntactic associations for the generated words already existed.

The main study which lends support to this experiment, however, is the work of Rabinowitz and Craik (1986). Rabinowitz and Craik maintain that a generation effect depends both on the processes involved in generation, and on the information present at the time of retrieval. They argue that the memorial enhancement is restricted to the specific information used in the generation process, and that a generation effect is observed only when this information is again utilized at the time of retrieval. In the present study, language-experience subjects used semantic and phonetic information to generate their to-be-learned words. This semantic and phonetic information also existed at retrieval, hence a generation effect was observed with subjects in the language-experience condition (i.e. language-experience subjects read the words faster than text condition subjects). In the "text" condition, subjects were given the to-be-learned words and therefore did not undergo the process of generating. All students involved in this study were exposed to both language-experience and text conditions and in every case, students in the language-experience condition read the words faster than those in the text condition.

Learning, as measured by accuracy and recognition memory, was not facilitated by the process of generating. While it was hypothesized that words would be learned faster in the language-experience condition, this, in fact, did not happen.

The language-experience approach, however, because of the inherent lexical access advantage, is making the task of "reading" easier for children, particularly beginning readers. When children bring to print, semantic and/or phonetic information, learning in one or two of the three domains of word learning already exists.

This study has noteworthy implications for teaching methodologies of beginning reading. Language-experience is a good method to utilize in that it draws on what the child already knows. By generating his/her own text, the child brings both semantic and phonetic information to the print.

Perhaps the most profound implication from this study is for the traditional classroom teacher who should be encouraged to open his/her mind to the less traditional methods of teaching beginning reading and become a "whole language" literacy facilitator. The traditional teacher should be redirected from the "vocabulary poverty" of traditional basal reading programs to whole, meaningful and relevant language which can be generated through language-experience approaches.

Inherent in every study are limitations to be considered in concert with the results. In this study, the to-be-learned words were isolated, studied thus to eliminate the bias of encoding context. Replicating this study using words in context rather than isolation would yield additional information about the beginning reading process and the importance of context to reading as a meaning-seeking process. Such a study, however, would also suffer from limitations, perhaps corollaries to the present study. Words studied in context would lack the visual exposure created by the isolation condition and, therefore, while learning on the semantic level might be successful, visual learning would be inferior to words which were learned in isolation.

Other limitations to the present study were the size and socio-economic background of the sample. A larger sample would enable the results to be generalized to a greater extent. Also, the fact that all subjects spoke English as their native language and came from middle to upper-middle class families limits how far the results can be generalized. Most subjects in this experiment had good oral language. One questions to what extent similar results would occur with language-impoverished children.

Another possible limitation occurred inadvertently through the process of matching subjects. Subjects were yoked with their closest match in terms of scores from the standardized reading test. The subjects also came from the same classroom, shared the same school experiences and often the same interests. Consequently, when a subject generated a word, not only did s/he bring semantic and phonetic information to the word; more than likely his/her partner also brought similar information. One has to question how much of a "text"-like condition was being created in such a situation.

In considering the limitations of this study, one must also question the impact of the program these students were involved in. Since the school offered a junior kindergarten program, these students were nearing the end of their third year (albeit half-time for two years). The subjects had been exposed to a "whole language" program during that time and had been involved in many language-experience activities. It would have been interesting to have matched these subjects with students from a traditional program or from an inner-city school where experiences and background probably would have been radically different.

Subsequent to the treatment and statistical analysis of the collective data, individual data was studied to determine if there were any differences between good readers and poor readers or if further information could be gleaned from individual subjects.

Subjects were rank-ordered according to their scores from the Stanford Diagnostic Reading Test and a chart was compiled listing the differences in reaction times from session one to session ten for each subject in both language-experience and text conditions. Differences in accuracy scores were also calculated for each subject in each condition.

It was immediately evident from the chart that all subjects who did not begin with 100% accuracy scores underwent an improvement in accuracy. With the exception of two very poor readers, all subjects experienced a greater increase in accuracy scores in the language-experience condition.

One subject in the language-experience condition produced a negative score in calculating the difference in reaction times from first to tenth session, while three subjects in the text condition emerged with negative scores. The language-experience subject with the negative score began with 100% accuracy, therefore did not sacrifice reaction time to achieve greater accuracy. The three subjects producing negative scores for reaction time differences from session one to session ten in the text condition, however, all improved their accuracy scores.

Other than these few observations, analyzing individual data offered no further insight.

In summary, the results of this study indicate that the language-experience approach creates faster lexical access and, consequently, faster word reading. Facilitation of this nature should make beginning reading an easier, more fluent process. It is also important to keep in mind that normal everyday language-experience lessons consist of generated episodes or stories which permit a great deal of contextual or top-down facilitation of the decoding processes. This too should result in more success in beginning reading.

Finally, the results of this experiment point towards the new writing to read methods being employed in today's schools. In these methods, children are being encouraged to generate their to-be-read units of language through the act of writing. If the model of the 'generation effect' (Glisky & Rabinowitz, 1985) advocated in this study is correct, the result should be greater activation of the to be learned word's visual features than is the case in traditional approaches. As writing also requires the activation of a word's lexical features, the total amount of across domain feature activation may also be greater in such cases. Thus, one would predict a larger 'generation effect' with this approach. This, of course, remains a matter for future research.

REFERENCES

Anderson, John R. "Interference: The Relationship Between Response Latency and Response Accuracy." Journal of Experimental Psychology: Human Learning and Memory, 1981, Vol. 7, No. 5, 326-343.

Anderson, John R. The Architecture of Cognition. Cambridge: Harvard University Press, 1983.

Baddeley, Alan D. Working Memory. New York: Oxford Press, 1986.

Baltensperger, Dorita C. "The Effect of Context on Self-Generated Words." Project, Brock University, 1983.

Bitondo, E., Putzman, N. and Wagner, J. "The effects of domain specific orienting tasks on the acquisition of new reading vocabulary by children: Toward a dual process theory of visual word learning." Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, 1985.

Butler, Andrea and Turbill, Jan. Towards a Reading-Writing Classroom. New Hampshire: Heinemann Educational Books, Inc., 1984.

Carroll, J.B. Language and Thought. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964.

Ehri, L.C. and Roberts, K.T. "Do beginners learn printed words better in contexts or in isolation?" Child Development, 1979, 50, 675-685.

Ehri, L.C. and Wilce, L.S. "Development of word identification speed in skilled and less skilled beginning readers." Journal of Educational Psychology, 1983, 75, 3-18.

Flores d'Arcais, Giovanni B. "Lexical Knowledge and Word Recognition: Children's Reading of Function Words." Visible Language, XVIII, 4, 1984, 353-371.

Gardiner, J.M. and Arthurs, F.S. "Encoding context and the generation effect in multitrial free-recall learning". Canadian Journal of Psychology, 1982, 36, 527-531.

Gardiner, J.M., Gregg, V.H. and Hampton, J.A. "Word Frequency and Generation Effects." Journal of Experimental Psychology: Learning Memory and Cognition, 1988, Vol. 14, No. 4, 687-693.

Gardiner, J.M. and Hampton, J.A. "Semantic memory and the generation effect: Some tests of the lexical activation hypothesis". Journal of Experimental Psychology: Learning, Memory and Cognition, 1985, 11, 732-741.

Glisky, E.L. and Rabinowitz, J.C. "Enhancing the generation effect through repetition of operations". Journal of Experimental Psychology: Learning, Memory and Cognition, 1985, 11, 193-205.

Goodman, Ken. What's Whole in Whole Language? Richmond Hill: Scholastic, 1986.

Harker, W. John. "The Language Experience Approach". McGill Journal of Education, 1981, v6, n1, 56-66.

Johns, Elizabeth E. and Swanson, Leila G. "The Generation Effect With Nonwords." Journal of Experimental Psychology: Learning, Memory, and Cognition, 1988, Vol. 14, No. 1, 180-190.

Just, M.A. and Carpenter, P.A. The Psychology of Reading and Language Comprehension. Toronto: Allyn and Bacon, Inc., 1987.

LaBerge, D. and S.J. Samuels. "Toward a Theory of Automatic Information Processing in Reading." Cognitive Psychology, 1974, 6, 293-323.

Manis, F.R. "Acquisition of word identification skills in normal and disabled readers". Journal of Educational Psychology, 1985, 77, 78-90.

McClelland, J.L. and Rumelhart, D.E. "An Interactive Activation Model of Context Effects in Letter Perception: Part 1. An Account of Basic Findings." Psychological Review, 1981, v88, n5, 375-407.

McElroy, Lori A. "The generation effect with homographs: Evidence for postgeneration processing." Memory and Cognition, 1987, 15 (2), 148-153.

McElroy, L.A. and Slamecka, N.J. "Memorial consequences of generating nonwords: Implication for semantic-memory interpretations of the generation effect." Journal of Verbal Learning and Verbal Behaviour, 1982, 21, 249-259.

McFarland, C.E., Frey, T.J., and Rhodes, D.D. "Retrieval of internally versus externally generated words in episodic memory." Journal of Verbal Learning and Verbal Behaviour, 1980, 19, 210-225.

Morton, John. "Facilitation in Word Recognition: Experiments Causing Change in the Logogen Model." In P.A. Kolers, M.E. Wrolstad and H. Bouma (eds.), Processing of Visible Language, I. New York: Plenum, 1979.

Morton, John. "Interaction of Information in Word Recognition." Psychological Review, 1969, Vol. 76, No.2, 165-178.

Nairne, J.S., Pusen, C., and Widner, R.L., Jr. "Representations in the mental lexicon: Implications for the theories of the generation effect". Memory and Cognition, 1985, 13, 183-191.

Nairne, J.S. and Widner, R.L., Jr. "Familiarity and Lexicality as Determinants of the Generation Effect." Journal of Experimental Psychology: Learning, Memory and Cognition, 1988, Vol. 14, No. 4, 694-699.

Nairne, J.S. and Widner, R.L., Jr. "Generation Effects With Nonwords: The Role of Test Appropriateness." Journal of Experimental Psychology: Learning, Memory, and Cognition, 1987, Vol. 13, No. 1, 164-171.

Noble, Eleanor F. "Self-Selection: A Remedial Strategy for Readers with a Limited Reading Vocabulary". The Reading Teacher, January, 1981.

Nolan, Suzanne M. "Textbook or Language Experience? An Experimental Study." Project, Brock University, 1982.

Payne, D.G., Neely, J.H. and Burns, D.J. "The generation effect: Further tests of the lexical activation hypothesis". Memory and Cognition, 1986, 14, 246-252.

Rabinowitz, J.C. and Craik, F.I.M. "Specific Enhancement Effects Associated with Word Generation". Journal of Memory and Language, 25, 1986, 226-237.

Reifman, B., Pascarella, E.T., and Larson, A. "Effects of Word-Bank Instruction on Sight Word Acquisition: An Experimental Note". Journal of Educational Research, Jan./ Feb., 1981, 175-178.

Samuels, S.J. "Modes of Word Recognition". In H. Singer and R.Ruddell (Eds.), Theoretical Models and Processes in Reading. Newark: International Reading Association, 1970, 23-37.

Slamecka, N.J. and Fevreiski, J. "The Generation Effect When Generation Fails". Journal of Verbal Learning and Verbal Behaviour, 22, 1983, 153-163.

Slamecka, N.J. and Graf, P. "The Generation Effect: Delineation of a Phenomenon". Journal of Experimental Psychology: Human Learning and Memory, 1978, Vol. 4, No. 6, 592-604.

Slamecka, N.J. and Katsaiti, L.T. "The Generation Effect as an Artifact of Selective Displaced Rehearsal." Journal of Memory and Language, 1987, 26, 589-607.

Smith, Frank. Understanding Reading. Toronto: Holt, Rinehart and Winston, 1982.

Spring, Carl. "Automaticity of word recognition under phonics and whole-word instruction". Journal of Educational Psychology, 1978, 70, 445-450.

Stauffer, Russell G. "Certain pychological aspects of children's learning to read". The Reading Teacher, 1969, v22, n7, 634-640.

Wagner, James. "Interference and facilitation in dual process visual word learning: Toward an interactive model." Paper presented at the Annual Canadian Society for the Study of Education Conference, Montreal, 1985.

White, D. Gordon. "Textbook or Language Experience: An Experimental Study. Teaching Words in Isolation or Context." Project, Brock University, 1982.

Yore, Larry D. and Ollila, Lloyd O. "Cognitive Development, Sex, and Abstractness in Grade One Word Recognition." Journal of Educational Research, 1985, Vol. 78, No. 4, 242-247.

	STIMULI	CHANGE BEGINNING OR END OF WORD	CHANGE A MIDDLE LETTER	CHANGE ORDER OF MIDDLE LETTERS
1				
2				
3				
4				
5				
6				
7				
8				
i.e.	team	feam	teum	taem

Appendix 1: Chart of Distractors Created from Stimuli

mountain
fossil
computer
picture
castle
poem
poster
birthday

Appendix 2: Sample List of Subject-Generated Words
(How they would appear on computer)

Appendix 3: Sample Training List

1 poem
2 catsle
3 binthday
4 fossel
5 yicture
6 tossil
7 fossil
8 birhtday
9 castlc
10 mouwtain
11 mountain
12 poster
13 postev
14 mountain
15 goem
16 poem
17 castle
18 picture
19 cactle
20 poster
21 mountaim
22 mountain
23 potser
24 computea
25 poster
26 fossil
27 peom
28 fosisl
29 monutain
30 computer
31 compater
32 paem
33 pitcure
34 computer
35 computer
36 castle
37 birthday
38 castle
39 fossil
40 picture
41 pinture
42 birthday
43 dirthday
44 birthday
45 comupter
46 picture
47 posker
48 poem

8 stimulus words appear three times (24) and three distractors for each word appear (24), totalling 48 words.

*The order of the training list was randomly changed for each of the ten sessions.

pinture

Appendix 4: Sample of Individual Presentation
(Distractor)

TRIAL	ACCURACY	RECOGNITION	COMMENTS	TRIAL	ACCURACY	RECOGNITION	COMMENTS
1				25			
2				26			
3				27			
4				28			
5				29			
6				30			
7				31			
8				32			
9				33			
10				34			
11				35			
12				36			
13				37			
14				38			
15				39			
16				40			
17				41			
18				42			
19				43			
20				44			
21				45			
22				46			
23				47			
24				48			

Appendix 5: Record Sheet of Accuracy and Recognition Scores

animals
art
aunt
ball
barbecue
Barbie
baseball
birthday
black flies
boat
bonnet
book
brother
bubbles
building
bullet
bunny
butterfly
cabbage
camping
castle
caterpillar
center
chipmunk
chores
clean
climb
clock
clown
coffee
computer
cottage
crumb
curtain
design
diving
dolphin
door knob
dough
dress
electric
family
fire cracker
fishing
flower
flowers
food
forest
forward
fossil
four
friend
fries
giant
glasses
goalie
golf
goose
gorilla
grandma
grandpa
ground hog
hamburger
hammer
hare
heart
helmet
hockey
hot dog
house
hulkster
icecream
impossible
Jason
Jennifer
journal
juggler
kick
kitchen
kitten
knob
light
machine
microwave
monkey
monsters
mosquito
motor
mountain
Mountie
movie
music
Muskoka
ocean
picture
pizza
plant
playhouse
poem
poster
pound
puppy
quickly
rabbits
raccoon
racing
raft
rapids
ribbon
roller coaster
room
rover
screw driver
shipping
shooting
sister
skates
sleeping
soccer
spaghetti
squirrel
stick
strawberry
string
swim
swimming
tackle
teacher
think
throw
Tina
tomato
toys
trailer
uncle
vacation
vase
volleyball
waterski
weapon
wedding
window
Wonderland
wood
wrestling

Appendix 6: List of all Subject-Generated Words (Languaage-Experience)

NAME: _________

CONDITION: LANGUAGE EXPERIENCE

EXPOSURE	3	6	9	12	15	18	21	24	27	30
R.T. REAL	3.0235	2.3673	2.7860	2.7079	2.2796	2.1992	2.8762	2.3151	2.2187	2.1536
R.T. DIST	4.0923	2.5430	2.6853	3.0948	2.8235	2.8696	3.0745	2.3366	2.3586	2.2767
ACC. REAL %	71%	83%	83%	88%	100%	100%	96%	100%	100%	100%
ACC. DIST %	42%	88%	92%	92%	83%	88%	92%	96%	96%	96%
RECOG. REAL %	71%	83%	83%	88%	100%	100%	96%	100%	100%	100%
RECOG. DIST %	38%	54%	58%	63%	71%	83%	79%	84%	83%	88%

CONDITION: TEXT

EXPOSURE	3	6	9	12	15	18	21	24	27	30
R.T. REAL	2.3853	2.1275	2.4234	2.2194	1.6430	2.1202	2.2235	2.1673	1.7969	1.9737
R.T. DIST	2.9119	2.8120	2.7173	2.5232	2.2666	2.2608	2.5777	2.2369	2.2224	2.0939
ACC. REAL %	96%	96%	100%	100%	100%	100%	100%	100%	100%	100%
ACC. DIST %	91%	91%	96%	100%	100%	100%	100%	100%	100%	100%
RECOG. REAL %	76%	96%	92%	96%	92%	100%	100%	96%	100%	88%
RECOG. DIST %	65%	65%	65%	78%	67%	83%	74%	78%	83%	100%

Appendix 7: Sample of One Subject's Data

AVERAGE REACTION TIME (SECONDS) - REAL WORDS

EXPOSURES	3	6	9	12	15	18	21	24	27	30
LANGUAGE EXPERIENCE	2.4205	2.0529	1.9262	1.8684	1.8156	1.7421	1.7407	1.7990	1.6822	1.7633
TEXT	2.5715	2.3433	2.2534	2.1054	1.8272	2.0396	1.9988	1.9521	1.9013	1.9179

AVERAGE REACTION TIME (SECONDS) - DISTRACTORS

EXPOSURES	3	6	9	12	15	18	21	24	27	30
LANGUAGE EXPERIENCE	2.9252	2.3033	2.1619	2.1193	2.0398	1.9787	1.9680	1.9256	1.8422	1.8717
TEXT	2.9757	2.6838	2.5223	2.3429	2.0993	2.1475	2.1479	2.0063	2.0684	2.0111

Appendix 8: Average Reaction Times for Real Words and Distractors in Both Conditions

AVERAGE ACCURACY (%) - REAL WORDS

EXPOSURES	3	6	9	12	15	18	21	24	27	30
LANGUAGE EXPERIENCE	85.5789	89.6364	95.5909	96.6364	97.6934	98.2273	97.7727	98.5000	98.5909	98.9545
TEXT	85.4211	88.7273	93.5909	95.5000	97.8182	98.3636	96.9545	98.1818	98.7273	99.4545

AVERAGE ACCURACY (%) - DISTRACTORS

EXPOSURES	3	6	9	12	15	18	21	24	27	30
LANGUAGE EXPERIENCE	73.8500	86.4091	91.1364	91.7727	92.5909	93.4091	94.2857	94.0000	94.9091	94.5455
TEXT	78.3333	88.8500	91.4286	93.6667	97.0000	98.0000	97.0000	94.2857	99.3810	98.7619

Appendix 9: Average Accuracy Scores for Real Words and Distractors in Both Conditions

AVERAGE RECOGNITION (%) - REAL WORDS

EXPOSURES	3	6	9	12	15	18	21	24	27	30
LANGUAGE EXPERIENCE	85.8889	94.1000	95.3500	97.4000	97.3500	99.2000	99.5789	99.3684	99.6000	99.5789
TEXT	83.3750	93.3889	92.8000	98.4000	97.6000	99.2000	98.1500	97.7500	99.0000	98.8000

AVERAGE RECOGNITION (%) - DISTRACTORS

EXPOSURES	3	6	9	12	15	18	21	24	27	30
LANGUAGE EXPERIENCE	52.3158	65.4091	64.5455	70.0455	76.1818	77.0909	84.3333	77.4091	84.0909	82.5909
TEXT	59.4211	61.3636	65.5455	66.8636	69.0455	78.0000	76.4091	82.0455	84.7727	84.0000

Appendix 10: Average Recognition Scores for Real Words and Distractors in Both Conditions